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the earlier cycadophyte stock. Accordingly he introduces before ARBER and PARKIN's "pro-anthostrobilus" an evolutionary stage characterized by the grouping of filicinean microsporophylls and megasporophylls in monosporangiate strobili, and to this hypothetical stage he gives the name "pteridostrobilus." This stage was temporarily a common one for the general cycad and angiosperm phyla; and at this stage the cycads practically stopped, with reduction of sporophylls; while the angiosperm phylum proceeded to the establishment of the bisporangiate condition, the evolution of angiospermy, the transformation of the habit of the vegetative body, etc. According to LIGNIER, the Bennettitales represent a different phylum, which branched from the cycadophyte phylum after the angiosperms, but still at the pteridostrobilus stage.—J. M. C.

Nitrogen fixing bacteria.—In a short preliminary paper¹⁹ BREDEMANN summarizes the conclusions deduced from his study of nitrogen fixing bacteria of the Clostridium type. Eleven cultures of the so-called "species" of various authors were compared with sixteen types isolated by himself. These types were from many sources, particularly soil from different parts of the world. A comparison of these forms cultivated under proper conditions for considerable periods has convinced him that all must be considered as a single species, the *Bacillus amylobacter* A. M. et Bredemann. Some characters, such as size of spores, motility, and development on culture media, are quite constant; others, as the ability to ferment nitrogen free solutions, are variable. Indeed, the variability of subcultures from a single stock may be made, by appropriate methods, to exceed the differences among the various so-called species and races. Most important, perhaps, are his conclusions relative to variation in nitrogen fixing power. Old cultures which had completely lost this capacity regained it when grown for a time in soil properly sterilized. This ability to fix nitrogen is closely correlated with that of fermenting nitrogen free solutions, and varies as greatly among various subcultures from a single stock as among those types that have been described as different species. Continued cultivation brings loss of power to fix nitrogen, but this power may be regained by appropriate culture methods.—R. E. BUCHANAN.

Variations of sexual organs of Saprolegnia.—KAUFFMAN²⁰ has obtained some extremely interesting results from some unusually guarded cultures of the Saprolegniaceae. He has found it possible to isolate species of Saprolegnia quickly by means of a single zoospore, and such pure cultures were used in his experiments. A great variety of solutions was used, but the best substances to

¹⁹ BREDEMANN, G., Regeneration der Fähigkeit zur Assimilation von freien Stickstoff des *Bacillus amylobacter* A. M. et Bredemann und der zu dieser Spezies gehörenden bisher als Granulobacter, Clostridium usw. bezeichnete anaeroben Bakterien (Vorläufige Mitteilung). Ber. Deutsch. Bot. Gesell. **26a**:362-368. 1908.

²⁰ KAUFFMAN, C. H., A contribution to the physiology of the Saprolegniaceae, with special reference to the variations of the sexual organs. Annals of Botany **22**: 361-388. pl. 23. 1908.